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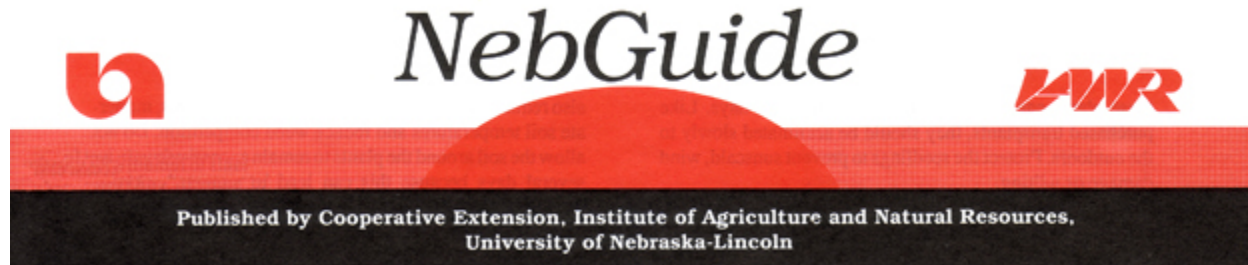
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Developing Replacement Beef Heifers (*Weaning-Breeding*)

This NebGuide discusses the proper selection, nutrition, breeding, and management of replacement beef heifers from weaning to breeding.

Gene H. Deutscher, Extension Beef Specialist

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Proper selection and development of replacement heifers is one of the most important management programs in beef production. Replacement heifers should be selected and managed so they will conceive and calve early in the calving season, provide adequate milk production, and rebreed and calve every 365 days.

Heifers bred as yearlings to calve as two-year-olds will produce an extra calf in their lifetime compared to heifers calving as three-year-olds, without detrimental effects on mature size, milk production, or calf weaning weights. The type of management heifers receive from birth to breeding has a great influence on their lifetime calf production. Therefore, it is imperative that heifers be selected and developed properly for efficient and optimum production over eight to ten calf crops.

Prewaning management of heifer calves can influence later productivity. Heifers should weigh at least 450 to 500 lbs at weaning, depending on breed, frame size, and feed supply. This weight should consist of skeletal and muscle growth without a substantial amount of fat. Do not give heifers creep feed during the suckling period as fat may be deposited in the developing udder, which will lower subsequent milking ability.

Growth promoting implants (Ralgro or Synovex-C) are used in suckling calves to increase weaning weights, but are not approved for use in breeding heifers. Since it is typically not known which heifers

will be kept for replacements at implanting time, use caution when implanting heifers. Research results are somewhat inconsistent, but generally indicate that implanting heifers with Ralgro once between 1 and 4 months of age has little to no effect on subsequent reproductive performance. However, avoid implanting shortly after birth or reimplanting at weaning as fertility may be impaired.

The period from weaning to breeding is one of the most critical for replacement heifers. Heifers can be conditioned to be either good or poor lifetime producing cows simply by how they are managed after weaning. Heifers developed properly will calve early during the first calving season. They will continue to calve early and wean heavier calves throughout their lifetime. Poorly developed heifers will fail to conceive or will calve late the first year and wean lighter calves. Many of the heifers that calve late will be open after a limited breeding season.

The goals for developing heifers should be: (1) to reach puberty by 12 to 14 months of age; (2) to have a high percent conceiving early in the breeding season; and (3) to be large enough in skeletal structure at calving to minimize difficulty. To achieve these goals, proper selection and feeding are necessary.

Selection of Heifers

The following factors should be kept in mind when selecting heifers.

At Weaning

1. Select the largest and oldest heifers because they will usually reach puberty earliest. Also, these heifers are usually from the earlier calving and/or heavier milking cows.
2. Select heifers that are structurally large, physically sound, in good health, and that have good growth potential. Performance records are helpful in determining growth potential and in identifying the calves from above average producing cows. Do not save heifers that are very fat at weaning because of the tendency for reduced milk producing ability.
3. If purchasing heifers is part of the replacement program, the availability of good quality stock is usually greater at weaning time and allows for feeding and breeding as desired. For producers who wish to maintain a two-breed-cross cow herd and use terminal sires, buying replacement heifers is a must. With limited feed resources, purchasing bred heifers may be desirable, but their availability will be lower.

As Yearlings

1. Save more heifers at weaning than actually needed for replacements so the slow growing heifers can be culled before breeding, and those failing to conceive during a short breeding season can be culled. If most heifers can be saved and bred as yearlings and only those conceiving early are kept for replacements, herd fertility can be improved.
2. Save only those heifers that conceive during a 30- to 45-day breeding season. Heifers should be pregnancy checked about 60 days after breeding and the open heifers moved to a feedlot for finishing.

Nutrition of Heifers

After selecting the heifers, normal growth and development through proper nutrition must follow to reach the goals of early puberty, early breeding, and sufficient heifer size at calving. Differences in breeds and animal gain needed must be recognized in developing a feeding and management program for heifer calves. A ration should be developed for adequate growth, but not for fattening. British breed

heifers need to gain about 1 lb per head daily from weaning to breeding; larger breeds and crosses need to gain 1 to 1.5 lbs daily.

Early Puberty

Puberty is a function of both age and weight. To reach puberty by 12 to 14 months of age, heifers must be fed properly to gain sufficient weight. Rate of gain can vary during segments of the development period as long as heifers reach the desired weight before breeding time. Heifers of various breeds should have the following weights before the breeding season begins for a high percentage to be cycling.

Table I. Weight needed to reach puberty by breeds	
Breed	Weight (lbs)
Hereford	600-650
Angus	575-650
Shorthorn	575-650
HxA or AxH	600-625
Charolais crosses	675-725
Simmental crosses	650-700
Limousin crosses	650-700
South Devon crosses	625-675
Tarentaise crosses	600-650
Pinzgauer crosses	600-650
Brown Swiss crosses	600-650
Gelbvieh crosses	600-650
Brahman crosses	700-750

To insure that all heifers reach these weights before breeding, they should be fed separately from the cow herd and, if possible, sorted according to size before the winter feeding period. Smaller heifers will require a higher concentrate ration for the faster rate of gain necessary to reach the desired weights than the larger, heavier heifers.

To determine the proper ration and rate of gain needed for a group of heifers, subtract their average weight from the desired weight at breeding, and then divide by the number of days of feeding before the start of the breeding season.

For example:

Angus x Hereford heifers average 450 lbs on November 1 at 215 days of age.
Breeding to start on May 1 at about 13 months of age.

Calculation:

Gain needed: $625 - 450 = 175$ lbs.

Feeding period: November 1 to May 1 = 180 days.

Avg. daily gain: 175 divided by 180 days = 1.0 lb per day.

Proper Feeding

Most heifers need to gain 1 to 1.5 lbs per day during the feeding period. Nutrient requirements for growing heifers to gain at these rates are shown in *Table II*.

Table II. Nutrient requirements of weaned heifer calves.¹								
Daily requirements								
<i>Heifer weight (lbs)</i>	<i>Gain (lbs)</i>	<i>Dry Matter Intake (lbs)</i>	<i>Total Protein (lbs)</i>	<i>ME (Mcal/lb)</i>	<i>TDN (lbs)</i>	<i>Ca (lb)</i>	<i>P (lb)</i>	<i>Vit. A (IU Thousand)</i>
<i>Medium Frame</i>								
500	1.0	11.8	1.11	1.02	7.3	.036	.025	14
	1.5	12.1	1.25	1.13	8.3	.046	.027	14
600	1.0	13.5	1.19	1.02	8.4	.038	.027	16
	1.5	13.8	1.32	1.13	9.5	.046	.029	16
<i>Large Frame</i>								
500	1.0	12.4	1.16	0.98	7.3	.038	.025	14
	1.5	12.9	1.32	1.05	8.3	.049	.026	14
600	1.0	14.1	1.25	0.98	8.3	.039	.027	16
	1.5	14.8	1.41	1.05	9.4	.049	.028	16
700	1.0	15.9	1.34	0.98	9.4	.040	.029	17
	1.5	16.6	1.49	1.05	10.6	.049	.032	17
¹ NRC, <i>Nutrient Requirements of Beef Cattle</i> , 1984. Requirements do not include extra energy needed during extremely cold weather.								

Many different combinations of feeds can be used for growing heifers. Homegrown feeds (hay, silage, and grains) plus additional supplements (protein, mineral, and vitamins) can be used successfully and economically. Heifers need to be grown rapidly but not fattened, so high quality hay and forages should be fed. If heifers are wintered on range, they should be fed at least 3 lbs of grain and 1 lb of 40 percent protein supplement per head daily to attain the recommended weight gains.

Taking periodic weights is helpful in determining if heifers are gaining at the lower rate. Some cycling should be observed in the heifers by 45 days before the breeding season; if not, additional grain or high energy supplement should be provided.

Rations for wintering heifers averaging 500 lbs to gain 1.0 lb per day are shown in *Table III*. A salt-mineral mix should be supplied free choice, using a moderately high phosphate (7-10% P) and calcium mineral. Vitamin A can be added in the supplement or to the salt mixture at the rate of 500,000 I.U. per 1.0 lb of salt.

The importance of the first winter nutrition level on heifer development, reproductive performance, and calf production is emphasized in *Table IV*. Heifers fed to gain over a pound per day cycled early and had high conception rates-55 percent in 21 days and 90 percent in 50 days. Pelvic areas were larger in the

heifers on the high and medium nutrition levels and these heifers tended to have less calving difficulty and less calf death loss. Calf weaning weights and percent cows rebred also tended to be higher for these two groups. Overall production efficiency (which takes into account reproduction, calf weaning weights, and cow size) was significantly higher for the heifers on the high nutrition level than for the heifers in the other two groups.

Table III. Wintering rations for 500-lb medium frame, replacement heifers to gain 1.0 lb/day. ¹					
Ingredient ²	Rations ³ , lb per day				
	A	B	C	D	E
Prairie hay, full bloom, 5-6% CP	7		10		
Alfalfa hay, 16% CP	4	12		4	
Corn silage, 35% DM				25	30
Shelled corn	3	2	3		
Soybean meal			1		1
Salt & minerals	free choice				
¹ These rations do not include extra energy needed for extremely cold weather.					
² Feeds are of average quality.					
³ To increase gains to 1.5 lbs/day, add about 1 lb corn or 4 lbs corn silage to rations.					
Approximately the same additions can be fed to large frame heifers of 600 lbs to gain 1 lb/day.					

Breeding of Heifers

Replacement heifers need to be on a good health program. They should be vaccinated for Brucellosis, Vibriosis, Leptospirosis, IBR (Red Nose), and any other diseases prevalent in the area prior to breeding. A good vaccination program is a good insurance policy.

Producers should consider breeding heifers 15 to 20 days before the cow herd. This practice has several advantages. It permits more time and labor to be given to the heifers during the calving season. Heifers can be watched more closely and assisted if necessary to reduce calf death losses. It also allows for a longer period from calving to rebreeding, which is needed by first calf heifers to regain body condition and begin cycling. Heifers should conceive earlier for their second calf and conception rates should be higher in a short breeding season. Calves will be older and heavier at weaning. The disadvantages are that it lengthens the calving season, and requires more feed after calving.

Table IV. Effects of nutrition and development on reproduction and calf production of Hereford replacement heifers.¹

<i>Item</i>	<i>Winter nutrition level</i>		
	<i>High</i>	<i>Med</i>	<i>Low</i>
No. heifers	51	51	51
Winter ADG, lb/day	1.1	0.8	0.55
Weight-after weaning, lbs	418	418	418
Weight-before breeding, lbs	587	555	532
Age before breeding (days)	417	417	417
Summer ADG, lbs/day	1.5	1.6	1.7
% cycling by 12 months of age	26	12	14
% cycling by 15 months of age	96	73	77
% conceived in 21 days of breeding	55	20	18
% conceived in 50 days of breeding	90	55	63
No. calving	46	28	32
Weight before calving, lbs	822	817	802
Yearling pelvic area (cm ²)	146	145	138
Calf birth weight, lbs	71	69	69
Calving difficulty (%)	30	18	38
Calf losses first week (%)	6.5	10.7	12.5
Calf weaning weight, lbs	441	435	416
Cows rebred (%)	91	93	88
Production efficiency, lbs ²	443	230	265
¹ G. H. Deutscher, So. Dakota State Univ. <i>Cow-calf Field Day Proceedings</i> , 1975.			
² Pounds of calf weaned per 1,000 lbs of cow exposed during breeding season.			

Another recommended practice is to breed heifers for only 30 to 45 days and cull the open ones at pregnancy check, about 60 days after removing the bull. This practice selects heifers with high fertility and also insures a short calving season.

Table V. Effects of sire breed on calving difficulty and calf birth weight.^{1,2}		
<i>Breed of sire</i>	<i>Calving Difficulty (percent)</i>	<i>Birth Weight (lbs)</i>
Hereford and Angus	2.9	79
Jersey	2.9	69
Red Poll	3.7	79
Tarentaise	6.0	83
Sahiwal	6.2	84
Pinzgauer	6.3	86
Gelbvieh	8.0	86
Brown Swiss	8.4	86
Limousin	9.4	86
Brahman	10.0	90
Chianina	11.8	89
South Devon	11.9	83
Simmental	14.9	89
Charolais	18.4	91
Maine Anjou	20.4	91
¹ Cows were Hereford and Angus, 4-years-old and over.		
² U.S. Meat Animal Research Center, Clay Center, NE. "Characterization of breeds of diverse biological types." <i>Beef Research Program, Progress Report NO. 1</i> . ARM-NC-21. April 1982.		

Calving Difficulty and Bull Selection

Calving difficulty (dystocia) is of great concern to producers with first calf heifers as it constitutes the primary cause of calf losses at birth.

The major causes of dystocia are an oversized calf or an undersized heifer. A large calf and/or a heifer with a small birth canal (pelvic size) cause difficult deliveries. Therefore, two methods can be used to reduce calving difficulty. One method is to grow-out and develop the heifers to be larger at calving. If heifers weigh 80 percent of their mature weight at calving, they should have less dystocia. Pelvic area of heifers can also be measured and those with small areas culled. Since the heritability of pelvic area is about 50 percent, selecting heifers and bulls on pelvic size can be beneficial.

The second method of reducing dystocia is by reducing calf size or birth weight. Calf birth weight is the major cause of calving difficulty. Since birth weight is 40 percent heritable, selecting bulls that sire calves with moderate birth weights can be effective in reducing difficulty. Birth weight information on a bull and his sire can also be helpful. Many sire directories have calving ease indexes on sires that indicate those to be used on heifers.

Some bulls within a breed and some breeds of bulls cause more calving difficulty than others. *Table V*

shows the calving difficulty experienced by four-year-old and older Hereford and Angus cows bred to large beef bulls. Using bulls from the larger breeds on heifers can increase calving difficulty considerably.

Producers must be careful in selecting bulls if no prior calving information is known. Many yearling bulls are used on heifers satisfactorily, but the old belief that a young bull will sire smaller calves is not true. Select bulls to be used on heifers for moderate birth weights adjusted for damage; and select against large shoulders, bones and head, thick muscling, and large hindquarters. Some producers use Longhorn bulls on small heifers; however, this practice is not foolproof. Also, the calves from these matings may not be as desirable or valuable at weaning as other crosses or straightbreds.

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